TREATABILITY STUDY PLAN

903 Pad, Mound, and East Trenches Areas

Operable Unit No. 2

Volume II

APPENDIX B Sampling and Analysis Plan
APPENDIX C Quality Assurance Addendum

EG&G ROCKY FLATS

Environmental Restoration Program

October 16, 1990

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

TABLE OF CONTENTS

VOLUME I
TEXT TREATABILITYSTUDY PLAN

LIST OF TABLES

LIST OF FIGURES

Page

APPENDIX A
TREATABILITY STUDY WORK PLANS

LIST OF TABLES

LIST OF FIGURES

Page

VOLUME II
APPENDIX B SAMPLING AND ANALYSIS PLAN

APPENDIX B-1 FIELD SAMPLING PLAN

LIST OF TABLES

LIST OF TABLES

LIST OF FIGURES

LIST OF TABLES

LIST OF FIGURES

Page

VOLUME III
APPENDIX D HEALTH AND SAFETY PLAN

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

APPENDIX B
SAMPLING AND ANALYSIS PLAN

INTRODUCTION

This Sampling and Analysis Plan (SAP) is specifically written to provide guidance for all field and laboratory work in support of the treatability study on surface water collected from Operable Unit No 2 at the Rocky Flats Plant This SAP consists of two documents referred to as Appendix B-1, the Field Sampling Plan (FSP) and Appendix B-2, the Laboratory Analysis Plan (LAP)

The FSP (Appendix-B1) provides specific guidance for field sampling activities required for this task The FSP describes sample locations, frequency of sampling, sampling designation, sampling equipment and procedures, sample handling and shipping, and all required documentation procedures

The LAP (Appendix-B-2) describes the sampling and analyses efforts during the treatability investigation The LAP specifies sample identification, chemical analysis method, sampling procedures, frequency of sampling, sample handling and shipping, and all required documentation procedures.

The field sampling activities to obtain surface water samples for OU2 treatability tests will be impacted by the climatic, hydrologic, and hydrogeologic conditions associated with the site These conditions are described in the Treatability Study Plan (TSP), Volume I

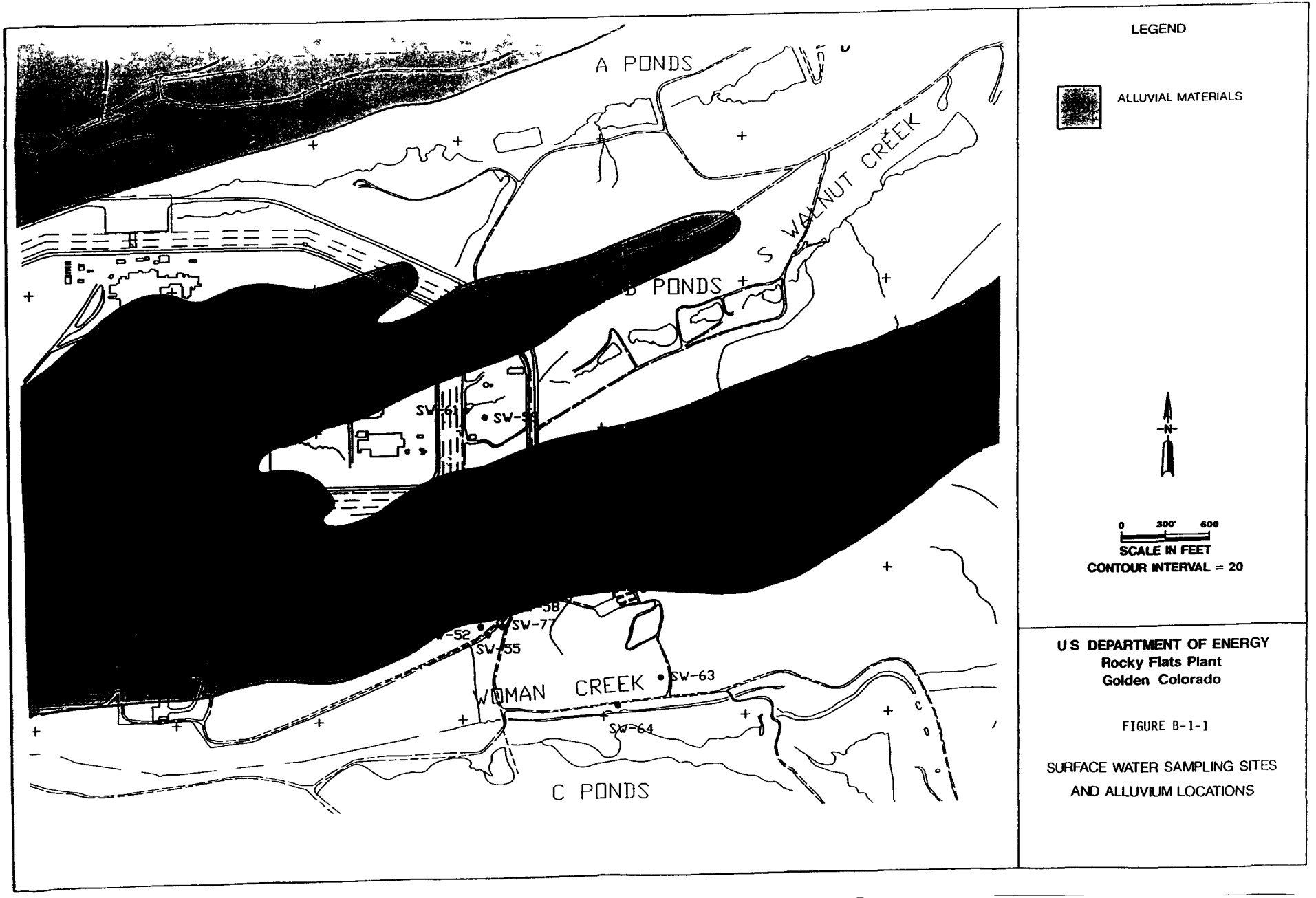
The number of sites available for sampling and the volumes of water available at the sites are also dependent on these physical constraints The field sampling procedures described in this Sampling and Analysis Plan (SAP) have been selected on the basis of these constraints This sampling plan is based on the assumption that a sufficient number of surface water sites possessing the flow volumes and water quality needed to meet data quality objectives will be available for sampling immediately preceding and during the treatability testing period

1 1 SURFACE WATER STATIONS

This section describes locations of surface water sites in the area of investigation The list of sites and locations are discussed in subsection 3 0.

903 Pad Area

There are several surface water sites downslope to the southeast of the 903 Pad (Figure B-1-1) Surface water stations that may be sampled in this investigation are sites in the 903 Pad Lip Area designated SW-50, SW-51, SW-52, SW-55, SW-57, SW-58, and SW-77 Station SW-50 is closest to the 903 Pad, and SW-57 and SW-52 are south of



U S DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden Colorado

FIGURE B-1-1

SURFACE WATER SAMPLING SITES
AND ALLUVIUM LOCATIONS

Samples of surface water will be collected for use in the treatability study Rather than obtaining water samples for characterization of water quality in OU2, the objective of this sampling program is to obtain samples which can be used to assess the performance of various treatment alternatives

A primary requirement for water samples to be used in the treatability study is that the samples contain contaminant concentrations which are within the average to high range of concentrations historically exhibited at the site This requirement, together with the hydrogeologic factors which may limit the number of sites available for sampling during the sampling event, are primary factors in sample location selection described in Section 3.1 and sampling procedures described in Section 5 0

The surface water sampling activities will be conducted and documented in a manner to ensure that sufficient data of known quality are collected to support sound decisions concerning treatment selection The data quality objectives (DQOs) used in design of the sampling program are as follows

- Provide weekly volumes of surface water for use in treatability testing of the technologies listed in Section 3 0 of the Treatability Study Plan, Treatment Technologies.

- Provide samples that, based on available data, contain contaminant concentrations representative of average to high levels compared with the contaminant concentrations recently determined to exist in the OU2 area

The hydrogeology, hydrology, and meteorology of the area will impact the number of sites available for sampling during the scheduled sampling period The following subsections discuss constituents to be analyzed, the number and volume of samples to be taken, sampling locations, and proposed sampling dates.

3 1 SAMPLING LOCATIONS

Figure B-1-1 illustrates the locations of the sampling sites The sites include·

SW50 SW51 SW52 SW53 SW55 SW57 SW58 SW59 SW61
SW63 SW64 SW77

It is possible that many of the sites may not contain water nor be producing flow when sampling occurs Sites will be presurveyed for the presence of water available at the site for sampling within a short time period before each sampling date Sites that contain water will be sampled

As noted in Section 2 0, historic analytical data will be used, as available, to determine which of the surface water sites containing water at the time of a scheduled sampling event also possess the highest historic concentrations of contaminants The sampling effort will concentrate on collecting as much water as is possible from such sites

3 2 SAMPLING DATES

Four weekly sampling events are anticipated These events are scheduled to occur on or about the dates listed in Section 5 0 of the TSP The length of each sampling event may range in time from one to five days This flexibility of the period of the sampling event is required because large volumes of water are required for use in the treatability testing, and volumes being produced by the seeps during the period in which sampling is anticipated to occur are typically small Further, the volumes required for use in the treatability testing vary from week to week, with larger volumes expected to be required during the initial weeks of testing

Slight variations in the concentrations of contaminants are expected to occur, given that the sampling events may each involve sampling of different sites from week to week This variation is not an issue in the treatability tests, however, because the technologies under evaluation are noncompetitive Slight variations in source material concentrations of contaminants will not effect efficiency of the technology being tested

3 3 CONSTITUENTS TO BE ANALYZED

The constituents to be analyzed are discussed in Appendix A-2, the Laboratory Sampling Plan, Section 2 1, Laboratories and Analytes

3 4 NUMBER OF SAMPLES

A total of approximately 250 gallons of water sample are needed for use in the treatability studies The volumes to be obtained each week for use in the treatability tests vary, depending upon the types of tests being performed during a given week Table B-1-1 lists the approximate volumes of surface water required for use in the treatability tests. The volumes of water listed on Table B-1-1 will include sufficient

TABLE B-1-1

VOLUMES OF SURFACE WATER REQUIRED FOR TREATABILITY TESTS

Test	Initial	Secondary	Final	Total
Gac-Rads	24 l	29 l		53 l
Gac-Orgs	24 l	72 l	15 l	111 l
Ion Exchange-Rads	44 l	44 l		88 l
Adsorb-Rads	15 l	44 l		59 l
Chem Coag/MF-Rads	32 l	75 l		107 l
Coag/Precip/Filt -S S	75 l	30 l		105 l
Totals	214 l	294 l	15 l	523 l

sample to provide (1) sample for the characterization of source material, as discussed in TSP Appendix B, Section 2 0, (2) samples for treatability tests, as listed on Table B-1-1, and (3) sufficient residual for testing of end products

The precise volumes of water taken from a given site on a given date will depend on the flow conditions in existence at the time of the sampling event Depending upon the number of sites containing water at the time of the sampling, approximately equal volumes will be collected at each site, if each site produces sufficient water to permit this If a particular site is producing a low volume of flow, then low-flow sampling, as described in Surface Water SOP No 7, Surface Water Sampling, will be performed The collection bowl will be left in place for an extended period of time to collect as large a volume as possible on the date of the sampling event It is recognized that this approach may permit loss of VOAs, which may need to be supplemented for test purposes by spiking

The water samples will be placed in large polyethylene carboys These will have capacities of approximately five gallons per container The surface water samples will not be composited in the field Prior to the weekly sampling event, existing hydrologic conditions will be assessed to determine the presence of water available for sampling at the sampling locations Based on this information, the greatest volumes of water may be collected from sites producing the highest discharge of water The carboys into which water samples are placed will be labeled with site identification numbers to distinguish the site of sampling The containers will then be transported to the base laboratory and then on to the treatability test laboratory

If sites possess so little flow that it is necessary to collect all of the water in the sampling area more than once during the sampling day, then the following steps will be taken The water will be dipped from the sampling site into a graduated stainless steel beaker or Teflon graduated cylinder The entire volume of water will be collected, and this

volume will be recorded in the sampling notes The sampling team may then move to the next site, and repeat this procedure, returning to the previously sampled site later in the day to obtain more sample. This approach allows for a return to sampling sites to obtain additional sample after the site has again filled with water This method will only be used if extreme low-flow conditions exist at the time of the sampling events

4 0
SAMPLE DESIGNATION

Samples will be identified in accordance with the numbering system described in Rocky Flats Plant Surface Water Data Collection Program Standard Operating Procedure No 2, Sample Control and Documentation

5 1 SAMPLING PROCEDURES

Samples will be collected by methods described in Rocky Flats Plant Surface Water Data Collection Program Standard Operating Procedure No 7, Rev 1 0, Surface Water Sampling Depending upon the volume of water available at a given sampling site, other samples will be collected by the method described in Subsection 7.3 1, Samples Collected by Container Immersion, or by procedures described in Subsection 7 3 8, Sampling Under Low Flow Conditions

5 2 EQUIPMENT

Equipment that is to be used for sampling is described in Rocky Flats Plant Surface Water Data Collection Program Standard Operating Procedure No 7, Rev 1 0, Surface Water Sampling, in Subsection 7 2, Equipment for Collecting and Compositing Samples

5 3 DECONTAMINATION

Sampling equipment decontamination and sample container decontamination procedures are described in Rocky Flats Plant Surface Water Data Collection Program Standard Operating Procedure No 4, General Equipment Decontamination Personnel decontamination procedures are described in Rocky Flats Plant Surface Water Data Collection Program Standard Operating Procedure No 5, Level D Personnel Decontamination

5 4 WASTE MANAGEMENT

Waste resulting from sampling procedures, and waste resulting from decontamination procedures are to be contained for proper disposal Procedures for Waste Management are described in Rocky Flats Plant Surface Water Data Collection Program Standard Operating Procedure No 9, Waste Management.

In particular, SOP No 9 details the following areas of waste management pertinent to the sampling activities described previously

- Equipment used to perform waste management
- Disposal of Personal Protective equipment
- Disposal of nonhazardous waste
- Disposal of solid field waste
- Waste management documentation

Sample preservation methods, shipping requirements, and holding times are described in Rocky Flats Plant Surface Water Data Collection Program Standard Operating Procedure No 3, Sample Containers, Preservation, Handling, Packaging, and Shipping For purposes of the sampling events to occur under this investigation, the following additional specific instructions apply

- Samples will be placed in polyethylene carboys
- No chemical preservatives will be used for treatability samples
- Cooling will be used, as described in the above noted SOP

Sampling activities will be documented in accordance with the following Rocky Flats Plant Surface Water Data Collection Program Standard Operating Procedures

- SOP No 2 Sample Control and Documentation
- SOP No 4 General Equipment Decontamination
- SOP No 5 Level D Personnel Decontamination
- SOP No 9 Waste Management
- SOP No 13 Chain of Custody Procedures
- SOP No 14 Logbook Protocol

Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final United States Environmental Protection Agency, EPA/540/G-89/004, OSWER Directive 9355.3-01, October 1988

Data Quality Objectives for Remedial Response Activities Development Process EPA Contract No 68-01-6939, March 1987

Surface Water Interim Measures/Interim Remedial Action Plan and Decision Document - 903 Pad, Mound, and East Trenches Areas, Operable Unit No 2 U S Department of Energy, Rocky Flats Plant, Golden, Colorado, May 25, 1990, Draft

Hurr, R Theodore Hydrology of a Nuclear-Processing Plant Site, Rocky Flats, Jefferson County, Colorado U S Geological Survey, Open-File Report 76-268, Denver, Colorado, March 1976

Rocky Flats Plant Surface Water Data Collection Program Standard Operating Procedures, prepared by Woodward-Clyde, April 1990

1 1 BACKGROUND

The Department of Energy (DOE) wishes to pursue an interim remedial action for surface water at the 903 Pad, Mound, and East Trenches Areas, now termed Operable Unit No 2 (OU2) at the Rocky Flats Plant (RFP) In accordance with the Resource Conservation and Recovery Act of 1976 (RCRA) as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), an Interim Measures/Interim Remedial Action (IM/IRA) is being conducted to minimize the migration of hazardous substances via surface water from areas that pose a potential long-term threat to the public health and environment DOE is implementing an IM/IRA Plan because of the length of time it typically takes to finalize a RCRA Facility Investigation/Remedial Investigation (RFI/RI), and Corrective Measures Study/Feasibility Study (CMS/FS)

Organic and inorganic contamination of surface water has resulted from past operational practices no longer permitted under current regulations EG&G has prepared an IM/IRA Plan to identify, screen, and evaluate appropriate interim remedial action alternatives, and select the preferred interim remedial action for the contaminated surface water

A treatability study is designed to test remedial alternatives in the laboratory or field to obtain data necessary for a detailed evaluation of their feasibility (EPA, 1989) The Interagency Agreement between the USEPA, the State of Colorado, and DOE which

governs remedial actions at Rocky Flats Plant, describes a site-wide treatability plan and site-specific treatability studies, if the characteristics of the specific site require additional treatability studies

The results of this treatability study are intended to evaluate the reduction of contaminants in OU2 surface water which can be achieved by each treatment listed below and to determine whether the treatment may have undesirable effects, such as producing large quantities of residual materials or potentially hazardous byproducts This information will then be available for further evaluation of each treatment method by more detailed methods, such as bench-scale studies with replicate measurements for statistical analysis, or pilot-scale studies of promising treatments

This bench-scale treatability testing will include studies of the following

- Granular activated carbon (GAC) for removal of volatile organic compounds (VOC) and selected radionuclides
- Coagulation/precipitation/filtration for removal of suspended solids
- Chemical coagulation and microfiltration for the removal of selected radionuclides
- Ion exchange for the removal of selected radionuclides
- Solidification/stabilization of test residuals
- Additional adsorption treatments for the removal of selected radionuclides

WC has subcontracted with a Denver-area laboratory (Hazen Research, Inc of Golden, Colorado) for utilization of laboratory bench space and supplemental analytical services during the bench-scale treatability studies This laboratory is off-site within reasonable driving distance of the Rocky Flats Plant so as to minimize transport of treatability samples from the site to the laboratory and travel time for EG&G and WC personnel engaged in periodic review of the treatability activities. The laboratory has all required

state and federal permits to allow receipt, storage, and treatability testing of hazardous, radioactive, and mixed waste samples at the facility The laboratory is equipped with sufficient chemical and radionuclide analysis equipment and has personnel trained in its use to provide the supplemental analytical methods required to support the treatability studies The Hazen Research, Inc Quality Assurance plan will be filed by WC

When USEPA-quality analytical services are required during the treatability test program (e g , full analytical suite characterization of raw seep/surface water composites and final treated effluents form optimal treatment technology bench tests), samples of such materials will sent to the contract laboratories selected under this task order.

1 2 SAMPLING OBJECTIVES

The results of this treatability study are intended to evaluate the reduction of contaminants in Operable Unit No 2 surface water which can be achieved by each treatment listed above and to determine whether the treatment may have unintended effects, such as producing large quantities of residual materials or potentially hazardous byproducts This information will then be available for further evaluation of each treatment by more detailed methods, such as bench-scale studies with replicate measurements for statistical analysis or pilot-scale studies of promising treatments

Although designated a "bench-scale" treatability study by EG&G, this study combines elements of both laboratory screening and bench-scale treatability testing, as defined by the USEPA (USEPA, 1989). The term "laboratory screening" refers to tests that are limited in size and scope, such as small-scale jar tests or beaker tests, and designed to establish the validity of a technology to treat contaminants from an operable unit This level of testing yields primarily qualitative data and is accompanied by minimum quality assurance/quality control (QA/QC) Testing of chemical coagulation/microfiltration and

coagulation/precipitation/filtration schemes to treat OU2 surface water will be at the laboratory screening level

The term "bench-scale" testing refers to bench-top separation, reaction, or other treatment steps performed in the laboratory (or field) with equipment designed to simulate the basic operation of a treatment process Bench-scale testing is intended to determine the technology's performance for the operable unit. This level of testing yields quantitative performance data and is accompanied by moderate to high levels of QA/QC Testing of ion exchange resin columns, granular activated carbon columns, and other adsorption columns in this study will be at the bench-scale level.

These studies are intended to help characterize the untreated and treated surface water samples from OU2, before and after optimal treatment technology bench tests These studies are not designed for site characterization of OU2

21 LABORATORIES AND ANALYTES

Four laboratories will be utilized for the analyses in the treatability study These laboratories, the methods to be used, and the analytes of interest are shown on Tables B-2-1, B-2-2, and B-2-3

22 SAMPLE CONTAINERS AND PRESERVATION

Only sample containers certified as clean by the manufacturer will be used for sample collection The containers and preservatives will be obtained from the contracted analytical laboratory Required preservatives will be added to the containers by the contracted analytical laboratory, sampling team, and/or the on-site chemist prior to or during sample collection

Table B-2-4 shows the analytes of interest for water and solid matrices with the associated container size, preservatives (chemical and/or temperature), and holding times

23 SAMPLE IDENTIFICATION

Each sample collected will have a unique sample identification number These numbers will be assigned prior to the sampling event. The sample identification number will follow the format

12ABC345

- The first two characters, shown as 12 in the example, represent the column number or run number that the sample was obtained from

- The third, fourth, and fifth characters, shown as ABC in the example, code for the treatment method from which the sample was taken Treatment method codes are as follows.

  CWC Composited Water Characterization
  IEX Removal of radionuclides by Ion Exchange
  GAR Removal of radionuclides by Granular Activated Carbon
  CCM Removal of radionuclides by Chemical Coagulation/ Microfiltration
  GAO Removal of volatiles by Granular Activated Carbon
  CPF Removal of suspended solids by Coagulation/ Precipitation/Filtration
  AAR Activated alumina adsorption column
  BCR Bone char adsorption column
  FXR Filox adsorption column
  GCS Gas chromatography screen

- The seventh character, shown as 3 in the example, codes for the sample type The sample type codes are as follows

  1 - Sample
  2 - Duplicate
  3 - Rinsate
  4 - Filter rinsate
  5 - Field blank

6 - Trip blank

7 - Treatment Blank

- The eighth and ninth characters, shown as 45 in the example, denote the specific sample number from the particular treatment and/or column run

TABLE B-2-1

LABORATORIES AND ANALYTICAL METHODS

LABORATORY	MATRIX	ANALYTE	METHOD
TMA/NORCAL 2030 Wright Ave Richmond, CA 94804 (415) 235-2633	Water	Radionuclide Suite	EG&G - Approved Methods
		Gross Alpha, Beta	
		$U^{233,234,235,238}$	
		$Pu^{239,240}$	
		Am^{241}	
TMA/Skinner-Sherman 101 First Ave P O Box 9046 Waltham, MA 02254 1-800-679-5599	Water	Metals Suite	Flame AA
	Water	Water Quality Parameters	
		Chloride	EPA Method 325 2
		Flouride	EPA Method 340 2
		Carbonate/Bicarbonate	EPA Method 310 1
		Nitrate/Nitrite	EPA Method 353 2
		pH	EPA Method 150
		Sulfate	EPA Method 375 4

TABLE B-2-1
(Continued)

		Total Dissolved Solids (TDS)	EPA Method 160 1
		Total Suspended Solids (TSS)	EPA Method 160 2
		Specific Conductivity	EPA Method 120 1
Vista Laboratories, Inc. 3830 High Court Wheatridge, CO 80033 (303) 467-0630	Water	Volatile Suite	EPA Method 8240
Hazen Research, Inc. 4601 Indiana St Golden, CO 80403 (303) 279-4501	Water	Total Suspended Solids Screen	Gravimetric
	Water	Gross Alpha/Beta Screen	Alpha-Beta Counting
	Water	Gas Chromatography Screen	EPA Method 601

TABLE B-2-2

ANALYTE LIST FOR METALS SUITE

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc

TABLE B-2-3

ANALYTE LIST FOR VOLATILES SUITE

Chloromethane
Bromomethane
Vinyl chloride
Chloroethane
Metylene chloride
Acetone
Carbon disulfide
1,1-Dichloroethene
1,1-Dichloroethane
total 1,2-Dichloroethene
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
Carbon tetrachloride
Vinyl acetate
Bromodichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dichloropropane
trans-1,2-Dichloropropane
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
cis-1,3-Dichloropropene
Bromoform
2-Hexanaone
4-Methyl-2-pentanone
Tetrachloroethene
Toluene
Chlorobenzene
Ethylbenzene
Styrene
total Xylenes
1,1-Dichloroethane

TABLE B-2-4
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Holding Parameter	Container	Preservative	Time
Matrix-Water:			
Organic Compounds.			
Volatiles Suite (VOCs)	2 x 40-mL VOA vials with teflon lined septum lids	Cool, 4°C[a] with HCl to pH<2	7 days 14 days
Inorganic Compounds.			
Radionuclide Suite	2 x 1-gallon polyethylene bottle	HNO_3 to pH<2	6 mo
Gross Alpha/Beta	1-liter polyethylene bottle	HNO_3 to pH<2	6 mo
Total Suspended Solids (TSS)	1 x 1-L polyethylene bottle	Cool, 4°C	7 days
Metals Suite	1 x 1-L polyethylene bottle	HNO_3 to pH<2	6 mo[b]
Water Quality Parameters	1 x 1-L polyethylene bottle	Cool, 4°C	7 days

[a] Add 0.008% sodium thiosulfate ($Na_2S_2O_3$) in the presence of residual chlorine

[b] Holding time for mercury is 28 days.

3 1 SAMPLE LOCATION AND FREQUENCY

The numbers and types of samples to be collected differ for each treatment method The sample collection frequency, analytes of interest, and QA/QC sample frequency for each treatment method are detailed below, and in Table B-2-5

3 1 1 Composited Water Characterization (CWC)

The composited water samples from the field will be characterized before their use in the treatment tests It is anticipated that four composited water samples, spaced one week apart, will be utilized in the treatment tests These waters will be sampled before their use in the treatment tests They will be analyzed for the volatiles suite, metals suite, radionuclide suite, and the water quality parameters

3 1 2 Granular Activated Carbon Treatment for Organics (GAO)

The granular activated carbon treatment for organics will be a column treatment Treatment testing will consist of four rounds A total of 26 column runs will be performed Two runs will be performed on each of five different GAC columns in round one One outlet sample will be collected from each run Two additional inlet samples will be collected Two QA/QC samples will also be collected The 14 samples will be analyzed for pH, conductivity, and the total organic carbon screen.

Round two will consist of up to ten column runs, an additional two runs will be performed on each of up to 5 columns One outlet sample will be collected from each

TABLE B-2-5
SAMPLE TYPE, LOCATION, AND FREQUENCY

TREATMENT	TESTING ROUND	ANALYSES	NUMBER OF RUNS	SAMPLE FREQUENCY/TYPE	QA/QC SAMPLES	TOTAL NO SAMPLES
CWC	N/A	Volatiles Suite Metals Suite Radionuclide Suite Water Quality Parameters	4 shipments	1 per week	none	4 weekly
GAO	1	pH Conductivity GCS	10	2 inlet 1 outlet per run	2 duplicates (1 inlet, 1 outlet)	2 inlet 10 outlet 2 QA/QC 14 total
	2	Water Quality Parameters Volatiles Suite	up to 10	2 inlet 1 outlet per run	1 duplicate (outlet) 1 MS/MSD (outlet) 1 field blank 1 treatment blank 1 trip blank	2 inlet 10 outlet 5 QA/QC 17 total

TABLE B-2-5 (Continued)

TREATMENT	TESTING ROUND	ANALYSES	NUMBER OF RUNS	SAMPLE FREQUENCY/TYPE	QA/QC SAMPLES	TOTAL NO SAMPLES
CWC	N/A	Volatiles Suite	4 shipments	1 per week	none	4 weekly
	3	pH Conductivity GCS	3	1 inlet 4 outlet per run	2 duplicates (1 inlet, 1 outlet)	1 inlet 12 outlet 2 QA/QC 15 total
GAO (cont'd)	4	Water Quality Parameters Volatiles Suite	3	1 inlet 1 outlet per run	1 duplicate (outlet) 1 MS/MSD (outlet) 1 field blank 1 treatment blank 1 trip blank	1 inlet 3 outlet 5 QA/QC total
GAR	1	pH Conductivity Gross Alpha/Beta Screen	10	2 inlet 1 outlet per run	2 duplicates (1 inlet, 1 outlet)	2 inlet 10 outlet 2 QA/QC 14 total
	2	Water Quality Parameters Metals Suite Radionuclide Suite	4	1 inlet 1 outlet per run	1 duplicate (outlet) 1 MS/MSD (outlet) 1 field blank 1 treatment blank	1 inlet 4 outlet 4 QA/QC 9 total

TABLE B-2-5 (Continued)

TREATMENT	TESTING ROUND	ANALYSES	NUMBER OF RUNS	SAMPLE FREQUENCY/TYPE	QA/QC SAMPLES	TOTAL NO SAMPLES
CWC	N/A	Volatiles Suite	4 shipments	1 per week	none	4 weekly
IEX	1	pH Conductivity Gross Alpha/Beta Screen	18	2 inlet 1 outlet per run	2 duplicates (1 inlet, 1 outlet)	2 inlet 18 outlet 2 QA/QC 22 total
	2	Water Quality Parameters Metals Suite Radionuclide Suite	6	2 inlet 1 outlet per run	1 duplicate (outlet) 1 MS/MSD (outlet) 1 field blank 1 treatment blank	2 inlet 6 outlet 4 QA/QC 12 total
AAR, BCR, FXR	1	pH Conductivity	18 runs	2 inlet samples 1 outlet per run	2 duplicates (1 inlet, 1 outlet)	2 inlet 18 outlet
		Gross Alpha/Beta Screen				2 QA/QC 22 total
	2	Water Quality Parameters Radionuclide Suite	6 runs	2 inlet	1 duplicate (outlet) 1 field blank 3 treatment blanks (1 each column)	2 inlet 8 QA/QC 16 total

TABLE B-2-5 (Continued)

TREATMENT	TESTING ROUND	ANALYSES	NUMBER OF RUNS	SAMPLE FREQUENCY/TYPE	QA/QC SAMPLES	TOTAL NO SAMPLES
CWC	N/A	Volatiles Suite	4 shipments	1 per week	none	4 weekly
CCM	1	pH Screen Conductivity Gross Alpha/Beta Screen	16 jars	2 pre-coagulation 1 post-coagulation per jar	2 duplicates (1 pre-, 1 post-)	2 pre- 16 post- 2 QA/QC 20 total
	2	Water Quality Parameters Metals Suite Radionuclide Suite	6 jars	2 pre-coagulation 1 post-coagulation per jar	2 duplicates (1 pre-, 1 post-)	2 pre- 6 post- 2 QA/QC 10 total
	3	Water Quality Parameters Metals Suite Radionuclide Suite	6 jars	1 post-microfiltration per jar	1 duplicate	6 post- 1 QA/QC 7 total
CPF	1	Total Suspended Solids Screen	75 jars	2 pre-coag/precip 1 post-coag/precip per jar	2 duplicates (1 pre-, 1 post-)	2 pre- 75 post- 2 QA/QC 79 total

TABLE B-2-5 (Continued)

TREATMENT	TESTING ROUND	ANALYSES	NUMBER OF RUNS	SAMPLE FREQUENCY/TYPE	QA/QC SAMPLES	TOTAL NO SAMPLES
CWC	N/A	Volatiles Suite	4 shipments	1 per week	none	4 weekly
	2	Total Suspended Solids (TSS)	15 jars	1 pre-filtration per jar 1 post-filtration per jar	2 duplicates (1 pre-, 1 post-)	15 pre- 15 post- 2 QA/QC 32 total
	N/A			1 post-solidification sample per residual mixture	NONE	18 post- 24 total

N/A = Not Applicable

of the column runs Two additional inlet samples will be collected Five QA/QC N samples will also be collected All of the samples collected will be analyzed for the water quality parameters and the volatiles suite

The third and fourth rounds of treatment testing will focus on column "breakthrough " Round three will consist of one column run on each of the three most effective GAC columns for organics removal Four outlet samples will be collected during each of the three runs Each outlet sample will be collected at a different time in order to determine column "breakthrough " One additional inlet sample will be collected Two QA/QC samples will also be collected All 15 samples will be analyzed for pH, conductivity, and a gas chromatography screen for volatiles

Round four will consist of three column runs One additional run will be performed on each of the three most effective GAC columns (the same ones used in round three) One outlet sample will be collected from each of the column runs Five QA/QC samples will also be collected All 8 samples will be analyzed for the water quality parameters and the volatiles suite

3 1 3 Granular Activated Carbon for Radionuclides (GAR)

The granular activated carbon treatment for radionuclides will be a column treatment Treatment testing will consist of two rounds A total of 14 column runs will be performed In round one, two runs will be performed on each of five different GAC columns One outlet sample will be collected from each of the ten column runs Two additional inlet samples will be collected. Two QA/QC samples will also be collected All 14 samples will be analyzed for pH, conductivity, and the gross alpha/beta screen

Round two will consist of four column runs An additional two runs will be performed on each of the two best GAC columns One outlet sample will be collected from each of the column runs One additional inlet sample will be collected Four QA/QC

samples will also be collected All nine samples will be analyzed for the water quality parameters, metals suite, and the radionuclide suite.

3 1 4 Ion Exchange for Radionuclides (IEX)

The ion exchange treatment for radionuclides will be a column treatment Treatment testing will consist of two rounds A total of 24 column runs will be performed In round one, two column runs will be performed on each of the nine different resins Each resin will be run using influents at two different pHs One outlet sample will be collected from each of the 18 column runs Two additional inlet samples will be collected Two QA/QC samples will also be collected All 22 samples will be analyzed for pH, conductivity, and the gross alpha/beta screen

Round two will consist of six column runs An additional two runs will be performed on each of the three best resins, at their best influent pH One outlet sample will be collected from each of the column runs Two additional inlet samples will be collected Four QA/QC samples will also be collected All 12 samples will be analyzed for the water quality parameters, metals suite, and the radionuclide suite

3 1 5 Adsorption of Radionuclides (AAR, BCR, and FXR)

The adsorption column testing for radionuclides will be performed on three different column packing materials Adsorption column tests for radionuclides using activated alumina (AAR), bone char (BCR), and Filox (FXR) will be performed Treatment testing will consist of two rounds A total of 24 column runs will be performed Two runs on each of the three different columns, each at three different pHs, will be performed in round one One outlet sample will be collected from each of the 18 column runs. Two additional inlet samples will be collected Two QA/QC samples will

also be collected. All 22 samples will be analyzed for pH, conductivity, and the gross alpha/beta screen.

Round two will consist of six column runs. An additional two column runs will be performed on each of the three adsorbents at their best pH One outlet sample will be collected form each of the column runs. Two additional inlet samples will be collected Eight QA/QC samples will also be collected. All 16 samples will be analyzed for the water quality parameters, metals suite, and the radionuclide suite

3 1 6 Chemical Coagulation/Microfiltration for Radionuclides (CCM)

The chemical coagulation/microfiltration treatment for radionuclides will be a jar test Treatment testing will consist of three rounds A total of 28 coagulation jar tests will be performed Jar tests on four different coagulants, each tested at four different concentrations, will be performed in round one One post-coagulation supernatant sample will be collected from each of the 16 jar tests in round one Two additional pre-coagulation samples will be collected Two QA/QC samples will also be collected All 20 samples will be analyzed for pH, conductivity, and the gross alpha/beta screen

Round two will consist of six jar tests One additional test on each of the four coagulants at their most effective concentration will be tested, along with two other coagulant/concentration combinations. One post-coagulation sample will be collected from each of the jar tests Two additional pre-coagulation samples will be collected Two QA/QC samples will also be collected All ten samples will be analyzed for the water quality parameters, metals suite, and the radionuclide suite

Round three will consist of six jar tests. Supernatant from each of the six treatment jars used in round two will be further treated by microfiltration. One post-microfiltration sample will be collected from each of the jar tests One QA/QC sample will also be

collected All seven samples will be analyzed for the water quality parameters, metals suite, and the radionuclide suite

3 1 7 Coagulation/Precipitation/Filtration for Suspended Solids (CPF)

The coagulation/precipitation/filtration treatment for suspended solids will be a jar test Treatment testing will consist of two rounds A total of 90 coagulation/precipitation jar tests will be performed. In round one, 75 jar tests will be performed Round one jar tests will be performed on five different coagulants, each of which will be tested at five different concentrations, of which each will be tested at three different pHs One post-coagulation/precipitation supernatant sample will be collected from each jar test Two additional pre-coagulation/precipitation samples will be collected Two QA/QC samples will also be collected All 79 samples will be analyzed for the total suspended solids screen

Round two will consist of 15 jar tests Supernatant from each of the best 15 treatment jars from round two will be further treated by filtration One pre-filtration sample and one post-filtration sample will be collected from each of the jar tests Two QA/QC samples will also be collected All 32 samples will be analyzed for total suspended solids (TSS)

3 2 SAMPLING PROCEDURES

The collection techniques, choice of sample containers, preservatives, and equipment are all critical to ensure that samples are not altered or contaminated Regardless of the collection method, care should be taken to prevent alteration of the chemical nature of the sample by agitating the sample or allowing prolonged contact with the atmosphere during collection.

VOC vials will be filled by dispensing water along the inside edge of the slightly tilted sample vial Care will be taken to eliminate aeration of the sample water The vials will be filled beyond capacity so the resulting meniscus will produce an airtight seal when capped The capped vial will be checked for trapped air by lightly tapping the vial in an inverted position If air becomes trapped in the vial, the sample water will be discarded, and a new vial will be filled VOC vials will never be filled and stored below capacity because of insufficient quantities of water

Except for the VOC vials, adequate air space should be left in the bottle to allow for expansion

Prior to sample collection, the sample bottles will be labeled by the sample manager Collection time and date will be marked by the sampler The labels will indicate.

- Activity name and/or number
- Unique sample number
- Sampling time and date
- Chemical preservative used
- Sample type (grab, composite)
- Analyses required
- Filtered/unfiltered
- Comments or special precautions, as needed

- Sampler's Initials

The sample label will be marked with a black waterproof pen If needed, clear tape will be placed over labels before sampling to assure that the labels remain legible

All field descriptions, measurements, and observations are to be recorded in a field logbook. Field data will be filled out at the time a sample is taken and will include, but not be limited to, the following information

- Sampling activity name and number
- Sampling point name and number
- Sample number*
- Name(s) of collector(s) and others present
- Date and time of sample collection*
- Sample container tag number (if appropriate)*
- Preservative(s) used*
- Requested analyses*
- Sample matrix*
- Filtered/unfiltered*
- Designation of QC samples* (ONLY for MS and MSD)
- Collection methods
- Chain of custody control numbers
- Field observations and measurements during sampling (comment section)
- Signature of responsible observer

Subsequent to sampling, the exterior of the sample containers will be decontaminated by rinsing with distilled water and wiping dry, sealed in plastic bags, and placed in

---

* Items will be documented on the COC form

coolers dedicated to samples and sample container transportation The temperature in the coolers will be maintained at 4°C ± 2°C by adding sealed plastic bags containing blue ice (or an equivalent) to the coolers

During the initial stages of field work, the sample manager will use a thermometer to verify that an adequate amount of blue ice is being used to maintain sample temperature at approximately 4°C ± 2°C.

3 2 1 Composited Water Sampling

Composited water samples will be delivered to the Hazen Research, Inc in a nalgene carboy Care will be taken to minimize agitation of the collected waters Collected water will be allowed to settle prior to use in treatability testing. Composited waters will be sampled from the top of the carboy using a pipet The interior of the pipet will be triple rinsed with the sample water before the actual sample is collected The sample will be taken from the top inch of the water in the carboy The pipet will then be allowed to drain into the appropriate sample container The sample for volatiles will be collected as soon as possible after the carboy is opened in order to prevent analyte volatilization Pipets will be decontaminated after use as specified in subsection 3 2 5

3 2 2 Column Sampling

Inlet and outlet samples from column treatments will be taken from a 3-way stopcock on the top (inlet) or bottom (outlet) of the adsorption column. Flushing and sampling must occur from an uninterrupted flow (i e the stopcock will be opened once at the onset of flushing, and not closed until after all the samples have been taken) The stopcock is to be fully opened and allowed to flush a volume equivalent to approximately

3 times the volume between the stopcock and the tubing outlet Samples will then immediately be collected for the analytes of interest.

Inlet sampling will be performed on the first column run of each treatment test When the treatment test will span a period of more than one day, an inlet sample will be collected from the first column run as well as the last column run.

3 2 3 Jar Sampling

Pre-treatment and post-treatment samples for jar tests will be taken directly from the jar by pipet or siphon The interior of the pipet or siphon tube will be triple rinsed with the sample before the actual sample is collected The sample will be taken from the top centimeter of liquid in the jar The pipet will then be allowed to drain into the appropriate sample container Pipets and siphon tubes will be decontaminated after use as specified in Subsection 3 2 5

3 2 4 QA/QC Sample Procedures

There are six types of QA/QC samples duplicate samples, equipment rinsate, treatment blanks, trip blanks, field blanks, and matrix spike/matrix spike duplicates Field QA/QC samples will be chosen on a random basis from the available population for the specific field QA/QC sample type.

Duplicate Samples

Field duplicate samples are independent samples collected in such a manner that they are, to the extent possible, equally representative of the parameter(s) of interest at a given point in time. The sample bottle will first be filled, followed by the duplicate

sample bottle Duplicate samples will be analyzed for the same analytes as the original sample

Equipment Rinsates

Equipment rinsate samples are obtained by pouring analyte-free distilled water through sample collection equipment (pipets, beakers, spatula, auger etc) after decontamination and collecting the rinsate in the appropriate sample container for chemical analysis The rinsate will be taken on the specific equipment used in the sample collection Equipment rinsate samples will be analyzed for the same methods as the associated original samples These samples will be used to determine the effectiveness of the decontamination procedures and to ensure that decontamination procedures are properly followed

Treatment Blanks

Treatment blanks are obtained by running analyte-free distilled water through the proposed treatment/column The treatment blank is run through the specific treatment/column used to generate the treated sample before the treated sample is generated Treatment blanks will be used to verify that the treatment/column itself is not a source of sample contamination.

Trip Blanks

Trip blanks are prepared prior to the sampling event by the analytical laboratory in 40-ml VOA containers and are kept with the VOC sample coolers throughout the sampling and transportation events They are then packaged for shipment with the samples and sent for analysis At no time after their preparation are the sample containers opened

before they reach the laboratory Trip blanks will be analyzed for volatile organics only

Field Blanks

Field blanks are prepared in the field during a sampling event. Sample bottles identical to those used for chemical analysis samples will be filled with distilled water in a manner similar to the sampling procedure. This process includes using the same personnel, location, and equipment whenever possible These samples will be used to evaluate the possibility of contamination because of the sampling environment

Matrix Spikes/Matrix Spike Duplicates

Matrix Spike and Matrix Spike Duplicate samples are independent samples collected in such a manner that they are, to the extent possible, equally representative of the parameter(s) of interest at a given point in time The matrix spike (MS) and matrix spike duplicate (MSD) are used by the contracting laboratory as a QA/QC check The same procedure used for collecting field duplicate samples will be followed when collecting the MS and MSD samples

3 2 5 Decontamination Procedures

Sampling tools, instruments, and equipment will be protected from sources of contamination before use and decontaminated after use Liquids and materials from decontamination operations will be properly disposed Sample containers will also be protected from sources of contamination. Sampling personnel will wear chemical-resistant gloves when handling samples Gloves will be decontaminated or disposed of after each sampling event.

When sampling equipment is used to collect samples that contain oil, grease, or other hard to remove materials, it may be necessary to steam clean the equipment before proceeding with Step 1 If the field equipment cannot be cleaned utilizing these procedures, it should be discarded

1 Wash equipment thoroughly with laboratory detergent and tap water and use a brush to remove any particulate matter or surface film.

2 Rinse equipment thoroughly with tap water

3 Rinse equipment thoroughly with distilled water

4 If the equipment is not decontaminated immediately after use, the sampling equipment should be thoroughly rinsed with tap water in the field as soon as possible after use

3 2 6 Waste Disposal

All wastes generated by decontamination and sampling of treated waters will be disposed of as specified in the Treatability Study Work Plan.

4 1 HOLDING TIMES

Sample containers, sample preservatives, and sample holding times are shown in Table B-2-4

4 2 SAMPLE TRACKING

Information records and tracking of samples will be accomplished by a Woodward-Clyde computer program This program will calculate the expiration of holding times based on sample collection dates, and extraction and analysis holding time criteria for each specific method of analysis requested on a particular sample Extraction and analysis holding times are calculated each day, and for every sample in the database This program will identify samples with holding times that are within two days of expiration The laboratory will then be contacted to verify that sample analysis has started The total number of field samples, specific analytes, and associated chains of custody generated during the sampling activity will be compared with the requested analytical results This process ensures that the samples collected in the field were analyzed by the contract laboratory as specified in this sampling plan.

4 3 SAMPLE CUSTODY

Official custody of samples must be maintained and documented from the time of collection until the time that valid analytical results have been obtained or the laboratory has been released to dispose of the sample The sampling team will be responsible for initiating the original chain of custody (COC) form and will sign and date this form when

relinquishing custody of samples to the sample manager. Upon receipt, the sample manager will check the COC and all sample labels to ensure that all samples are accounted for and in good condition, and that no errors were made in labeling and/or completing the COC A sample chain of custody form is shown in Figure B-2-1.

A sample is considered to be in a person's custody if any of the following conditions are met

- The sample is in the person's physical possession
- The sample is in line of sight of the person after he/she has taken possession.
- The sample is secured by that person so that any tampering can be detected
- A sample is secured by the person in possession in an area which only authorized personnel can enter

If, at any time after samples have been secured, custody seals are identified as having been tampered with, this procedure will be followed to ensure that sample integrity has not been compromised

- Check cooler temperature to verify 4°C ± 2°C
- Check with all personnel having access to sample coolers to verify possible inadvertent tampering
- Check every sample container for any signs of tampering i e loose lids, foreign objects in containers, broken or leaking containers, etc.

Woodward-Clyde Consultants
Stanford Place 3 Suite 1000 4582 South Ulster Street Parkway
Denver Colorado 80237 (303) 694 2770

Chain of Custody Record

PROJECT NO

SAMPLERS (Signature)

DATE	TIME	SAMPLE NUMBER	ANALYSES	NUMBER OF CONTAINERS

REMARKS
(Sample preservation handling procedures etc.)

For _____

Matrix –

All samples stored on ice

Contact personnel

TOTAL NUMBER OF CONTAINERS

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)

METHOD OF SHIPMENT	SHIPPED BY (Signature)	COURIER (Signature)	RECEIVED FOR LAB BY (Signature)	DATE/TIME

(4020-300-39)(LAP 1)(09/19/90)pg.29

Job No	22558
Prepared by	BRC
Date	9/19/90

FIGURE B-2-1
SAMPLE COC FORM

- Check to assure adequate and appropriate packaging

- Document all findings of the incident in the sample manager's field log book

If it is determined that malicious tampering of samples has occurred and/or it is believed that sample integrity has been compromised, the sample manager will immediately contact Mr Steven Baca of Woodward-Clyde Federal Services at 740-2700

If it can be determined that sample integrity has not been compromised based on the above criteria, findings should be documented in the sample manager's field logbook,and sample collection activities should resume

An example of a three-page carbonless COC form is shown in Figure B-2-1 The original and second (yellow) copy will be included with the samples to be shipped enclosed in a plastic bag and taped inside the lid of the cooler The third (pink) copy along with a photocopy of the original will remain on file at the on-site facility The contract laboratory will sign as having received the samples and return the yellow copy of the COC to the project management office for verification by the QA/QC officer or their designee The yellow and pink copies will then be matched and filed to complete the chain of custody procedure

The chain of custody form will include the following information·

- Unique sample number and sample location
- Project number
- Date and time of sample collection
- Signature of collector or field custodian

- Laboratory designation
- Sample matrix
- Condition of sample on receipt at the laboratory
- Chain of custody control number
- Signature and date blocks for personnel relinquishing or receiving sample custody
- Space for additional comments
- Name and phone number of emergency contact person
- Analysis requested
- Out of spec reporting

If a chain of custody (COC) record should become lost during shipment or after receipt by the laboratory, the sample manager (or designee) will fill out a new form using information from the file copy of the original In the "remarks" section of the replacement COC, BOTH COC numbers (located in the upper left hand corner of every COC form) will be written down and the new COC and file copies of the original COC will be attached and filed at the onsite facility to document the losing and replacement of chain of custody for the associated samples

If it becomes necessary to make changes/deletions/corrections or any modifications to the original chain of custody form after it has left the sampling site, the following procedure will be followed·

- Direct telephone communication between the sample manager or designee and the chemical laboratory sample custodian or designee to verify that a modification must be made to an original COC form

- Verbal agreement by both parties on the modification to be made

- Each party will make the change on their respective copy of the original COC, initialing and dating each modification.

- The originating party of the original COC (i e., sample manager) will fax a copy of the modified COC to the laboratory for visual verification of modifications to ensure corrections were made accordingly This process is to be completed within 24 hours of modifications.

- The lab, upon receipt of the fax, will contact the sample manager and verify receipt of correct modifications The lab will send a copy of their modified COC to the sample manager.

4 4 SHIPPING PROCEDURES

All sample containers will have been decontaminated and bagged at the time of sample collection Upon receipt and verification of sample containers and COC forms, the sample manager will take the following steps

- Line the sample cooler with a large plastic bag

- Place approximately 3 inches of vermiculite in the bottom of the cooler

- Wrap glass containers in bubble pack.

- Verify that all samples requiring screening have reported estimated radiological activity levels

- Place bagged and wrapped sample containers upright, except for the volatile organic compounds (VOC) vials, in the cooler with approximately 1 inch between them and the sides of the cooler.

- Fill the cooler approximately three quarters full of vermiculite, making sure that sample containers are securely packed

- Insert the two VOC vials upright in the center of the cooler

- Fill the cooler with vermiculite, allowing adequate space at the top for blue ice

- Bag the blue ice (or equivalent) and place several packages in the top space of the cooler **

- Seal the signed COCs in a plastic bag and tape it to the underside of the lid of the cooler

- Tape the drain of the cooler shut

- Wrap strapping tape around the cooler in two locations to secure the lid

- Place the airbill on top of the cooler If more than one cooler is sent to the same laboratory, an address label and a manifest label are needed

- Place "This Side Up" labels on all four sides and "Fragile" labels on the top and two sides of the cooler

---

** See Table B-2-4 for analytes requiring 4°C ± 2°C.

- Place "Environmental Samples" label on top of cooler For coolers over 75 pounds, an additional "Heavy Weight" label is required in the upper left corner on top of the cooler

- Place signed and dated custody seals in two locations sealing the cooler lid so that tampering will be evident.

Sample coolers may be received by courier at a pre-determined area If arrangements cannot be made, a Company vehicle is required to deliver sample coolers to the laboratory and/or courier office

TITLE AND APPROVALS

QUALITY ASSURANCE ADDENDUM
BENCH-SCALE TREATABILITY STUDY
SURFACE WATER, OPERABLE UNIT 2
ROCKY FLATS PLANT

BOA CONTRACT NUMBER BA 56801PB

Approval	Date
WCC QA/QC Officer	
EG&G QA Officer	
WCC Project Manager	
EG&G Project Manager	

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

This Quality Assurance Addendum (QAA) has been prepared by Woodward-Clyde (WC) for the bench-scale treatability study of surface water collected from Operable Unit 2 (OU2), Rocky Flats Plant (RFP) This QAA, along with the Draft Sitewide Quality Assurance Project Plan (QAPjP) for CERCLA Remedial Investigations/Feasibility Studies (RI/FS) at Rocky Flats (EG&G Rocky Flats, Inc , EG&G, 1990c), constitutes the project-specific QAPjP for the bench-scale treatability study

In accordance with U S Environmental Protection Agency (USEPA) guidance, a Sampling and Analysis Plan (SAP) composed of the Field Sampling (FSP) and project-specific QAPjP have been prepared for this bench-scale treatability study (USEPA, 1988) For this study, both a FSP (for collection and handling of surface water samples in the field) and a Laboratory Analysis Plan (LAP) (for collection and handling of samples to be tested in the laboratory) are included in Volume II, Appendix B

WC adheres to an internal Quality Assurance (QA) Program to ensure quality of service This QA program describes procedures within WC which establish lines of responsibility, authority, and accountability, develop and maintain qualified staff, define methods of operation, provide for documentation of activities; and set up procedures for auditing (WC, 1988)

This project-specific QAPjP contains the 16 elements of a QAPjP, as required by USEPA guidance (USEPA, 1988) The location of these elements in the sitewide

QAPjP is indicated in Table C-1 Elements of the QAPjP which are addressed in the sitewide QAPjP will not be discussed in detail in this QAA Instead, this QAA will address QA elements specific to work on this project, or QA elements which are not covered in sufficient detail in the sitewide QAPjP to meet the needs of this project

Incorporation of elements of the sitewide QAPjP by reference in the WC QAA is provisional, subject to final USEPA approval of the sitewide QAPjP As of this writing (September 1990), the sitewide QAPjP has not been approved by the USEPA, U S Department of Energy (DOE), or other designated regulatory agencies The WC QAA will be revised to reflect changes to the EG&G sitewide QAPjP, as this sitewide document is reviewed, revised, and subsequently approved by the regulatory agencies

Some specific elements of the sitewide QAPjP do not apply to this bench-scale treatability study and will be noted as not applicable in the QAA

TABLE C-1

LOCATION OF QAMS-005/80 ELEMENTS WITHIN THE SITEWIDE RI/FS QAPjP

	EPA QAMS-005/80 Element	Sitewide QAPjP Section
1	Title Page with Approvals	Title and Approvals
2	Table of Contents	T of C
3	Project Description	Intro and Scope
4	Project Organization and Responsibility	1 0
5	Data Quality Objectives (DQOs)	3 3 1
6	Sampling Procedures	3 3 2 and 5 3
7	Sampling Custody	8 0
8	Calibration Procedures and Frequency	12 3 3 and 12 3 4
9	Analytical Procedures	3 0
10	Data Reduction, Validation, and Reporting	3.3 3
11	Internal Quality Control Checks and Frequency	3 3 4
12	Performance and System Audits and Frequency	18 3
13	Preventive Maintenance Procedures and Schedules	12.3 5
14	Specific Routine Procedures to Assess Data Quality	3.0
15	Corrective Action	16.0
16	Quality Assurance Reports to Management	2 4

C-1 0 ORGANIZATION

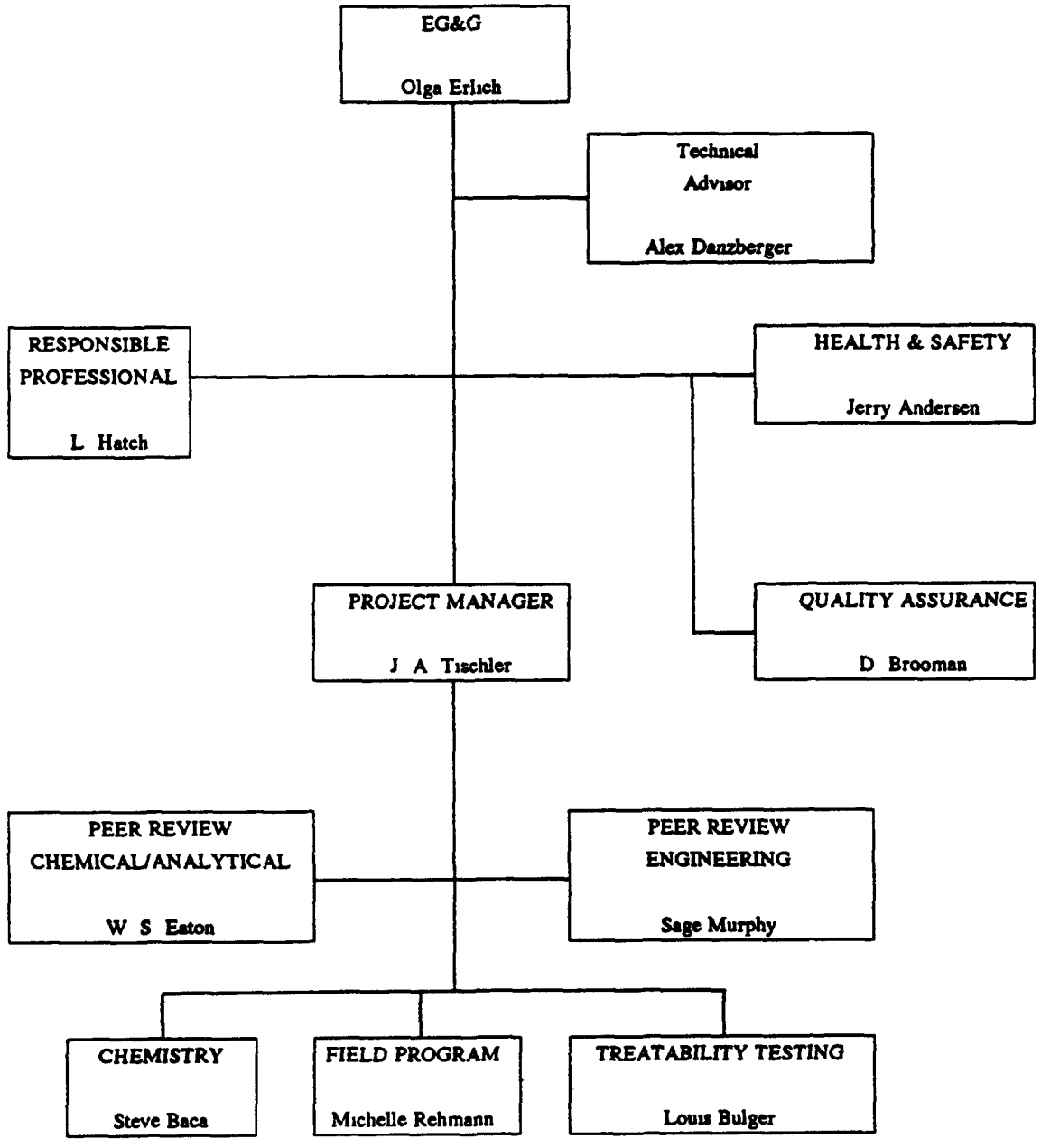
C-1 1 RESPONSIBILITIES OF KEY PARTICIPANTS

Key Woodward-Clyde project personnel are named in Figure C-1 WC is a subcontractor to the EG&G Environmental Restoration (ER) Program Overall management responsibilities for the work governed by the project-specific QAPjP rest with DOE and EG&G Their responsibilities are discussed in Section 1 3 of the site-wide QAPjP WC reports to the EG&G ER Remedial Programs Project Manager (Olga Erlich) The Rocky Flats ER management system is depicted in Figure 1-2 of the sitewide QAPjP

C-1 2 PROJECT DESCRIPTION

The Rocky Flats Plant (RFP) is a government-owned, contractor-operated facility located in northern Jefferson County, Colorado It is part of the Department of Energy (DOE) nuclear weapons research, development, and production complex administered by the DOE's Rocky Flats Office The management and operating contractor for the RFP is EG&G Rocky Flats, Inc (EG&G)

FIGURE C-1
PROJECT ORGANIZATION
TREATABILITY STUDY
SURFACE WATER, OPERABLE UNIT 2
ROCKY FLATS PLANT



(4020-300-39) (ORGCHRT) (15-Oct-90)

C-1 2 1 Treatability Study

A treatability study is designed to test remedial alternatives in the laboratory or field to obtain data necessary for a detailed evaluation of their feasibility (EPA, 1989) The Inter-agency Agreement between the USEPA, the State of Colorado, and DOE, which governs remedial actions at RFP, describes a sitewide treatability plan and project-specific treatability studies, if the characteristics of the specific site require additional treatability studies

The results of this treatability study are intended to evaluate the reduction of contaminants in OU2 surface water which can be achieved by each treatment listed below and to determine whether the treatment may have undesirable effects, such as producing large quantities of residual materials or potentially hazardous byproducts This information will then be available for further evaluation of each treatment method by more detailed methods, such as bench-scale studies with replicate measurements for statistical analysis, or pilot-scale studies of promising treatments

This bench-scale treatability testing will include studies of the following

- Granular activated carbon (GAC) for removal of volatile organic compounds (VOCs) and selected radionuclides
- Coagulation/flocculation and settling for removal of suspended solids
- Centrifugation for removal of suspended solids
- Chemical coagulation and microfiltration for the removal of selected radionuclides

- Ion exchange for the removal of selected radionuclides
- Adsorbents (activated alumina, bone char, and Filox) for removal of radionuclides
- Solidification/stabilization of test residuals

WC has subcontracted with a Denver-area laboratory (Hazen Research, Inc of Golden, Colorado) for utilization of laboratory bench space and supplemental analytical services during the bench-scale treatability studies This laboratory is off-site within reasonable driving distance of the RFP so as to minimize transport of treatability samples from the site to the laboratory, as well as travel time for EG&G and WC personnel engaged in periodic review of the treatability activities The laboratory has all required state and federal permits to allow receipt, storage, and treatability testing of hazardous, radioactive, and mixed waste samples at the facility. The laboratory is equipped with sufficient chemical and radionuclide analysis equipment and has personnel trained in its use to provide the supplemental analytical methods required to support the treatability studies Full specifications are provided in the Quality Assurance Plan and Standard Operating Procedures (SOPs) from Hazen Research, Inc, which are filed with the laboratory audit report

When USEPA-quality analytical services are required during the treatability test program (e g , full analytical suite characterization of raw seep/surface water composites and final treated effluents from optimal treatment technology bench tests), samples of such materials will be sent to the contract laboratories selected under this task order

C-1 2 2 Operable Unit No. 2 Description

There are 20 sites designated as Individual Hazardous Substance Sites (IHSS) which comprise the 903 Pad, Mound and East Trench Areas These sites are known collectively as Operable Unit 2, and are located east-southeast of the RFP These sites are described in Section 2 3 of this Treatability Study Plan and in the Proposed Surface Water Interim Measures/Interim Remedial Action Plan (IM/IRAP) and Decision Document, September26, 1990 for OU2 (DOE, 1990)

C-2 0
QUALITY ASSURANCE PROGRAM

C-2 1 QA PROJECT PLAN BASIS

The QA program that will be used on the proposed project includes three basic elements (1) adherence to the system of audits, checks, and verifications set forth in the project-specific QAPjP, (2) project management review of all work completed by the project team, and (3) independent WC peer review of all technical work projects developed by the project team Project management review will consist of establishing the goals and objectives of the program, developing overall and specific methods to meet project objectives, ensuring that these methods are utilized, and verifying the consistency and accuracy of all analyses and conclusions This guidance is provided by the project-specific QAPjP for the bench-scale treatability study Peer review will be completed by senior WC technical and management personnel who are involved in senior consultation on this project WC has an established, formal internal peer review program that is implemented on all projects The program consists of critical review of contract requirements and major work products, development of comments, and required reconciliation of all comments. Consistency and accuracy of technical conclusions are emphasized in the review of major work products

C-2 2 QUALIFICATIONS OF PROJECT PERSONNEL

Personnel involved in activities affecting quality shall receive appropriate training and orientation in QA procedures as specified in Section 2 4 of the sitewide QAPjP.

C-2 3 PERSONNEL TRAINING

Project personnel will be trained in their areas of responsibility, as required by Section 2 4 1 of the sitewide QAPjP.

C-2 4 QUALITY ASSURANCE REPORTS TO MANAGEMENT

A QA summary report will be prepared at the conclusion of the bench-scale treatability study by the Project QA/QC Officer or designee and approved by the Program QA/QC Officer The QA summary report will be included in the final report of the treatability study

This QA report will include, but not be limited to, a summary of the following a report of the field operations audit described in Section C-18 1 of this QAA, a report of the audit of project laboratory handling and sampling procedures, a report of the review of all pertinent project laboratory notebooks, and a report of the verification of analytical results

C-3 0
DESIGN CONTROL

C-3 1 DATA QUALITY OBJECTIVES

Overall data quality objectives (DQOs) for activities at the Rocky Flats Plant are discussed in Section 3 3 1of the sitewide QAPjP Additional project-specific data quality objectives of the project are discussed below

C-3 1 1 Data Quality Objectives of This Study

As noted in Section C-1 0of this QAA, the results of this treatability study are intended to evaluate the reduction of contaminants in OU2 surface water which can be achieved by each treatment and to determine whether the treatment may have undesirable effects, such as producing large quantities of residual materials or potentially hazardous byproducts This information will then be available for further evaluation of each treatment by more detailed methods, such as bench-scale studies with replicate measurements for statistical analysis or pilot-scale studies of promising treatments

Although designated a "bench-scale" treatability study by EG&G, this study combines elements of both laboratory screening and bench-scale treatability testing, as defined by the USEPA (USEPA, 1989) The term "laboratory screening" refers to tests that are limited in size and scope, such as small-scale jar tests or beaker tests, and designed to establish the validity of a technology to treat contaminants from an operable unit This level of testing yields primarily qualitative data and is accompanied by minimum quality

assurance/quality control (QA/QC). Testing of chemical coagulation/microfiltration and coagulation/precipitation/filtration schemes to treat OU2 surface water will be at the laboratory screening level

The term "bench-scale" testing refers to bench-top separation, reaction, or other treatment steps performed in the laboratory (or field) with equipment designed to simulate the basic operation of a treatment process Bench-scale testing is intended to determine the technology's applicability for treating operable unit wastes This level of testing yields quantitative performance data and is accompanied by moderate levels of QA/QC Testing of ion exchange resin, adsorbents, and granular activated carbon (GAC) columns will be at the bench-scale level in this study

On the USEPA's table of five analytical levels (Table C-2), the QA/QC employed for this study is in the Level II range for laboratory screening studies and Level III for the bench-scale studies Aspects of the testing requiring more documentation and thus a higher level of QA/QC include the characterization of the composite water samples used as the starting material for treatability studies and characterization of the inlet and outlet samples from the second round of testing of the treatments judged most efficient in contaminant removal

For the laboratory screening studies and preliminary runs of the bench-scale studies (analytical Level II), results will be judged by the efficiency of the treatment, or the percentage reduction of the indicator parameter [total suspended solids (TSS), total organic carbon (TOC), or total alpha/beta activity] These first-round results are essentially semi-quantitative or qualitative in nature However, for the initial

TABLE C-2
SUMMARY OF ANALYTICAL LEVELS[a]

	Level I
Type of analysis	Field screening or analysis with portable instruments
Limitations	Usually not compound-specific, but results are available in real time Not quantifiable
Data quality	Can provide an indication of contamination presence Few QA/QC requirements

	Level II
Type of analysis	Field analyses with more sophisticated portable instruments or mobile laboratory Organics by gas chromatography (GC), inorganics by atomic absorption (AA), inductively coupled plasma (ICP), or X-ray flourescence (XRF)
Limitations	Detection limits vary from low parts per million to low parts per billion Tentative identification of compounds Techniques/ instruments limited mostly to volatile organics and metals
Data quality	Depends on QA/QC steps employed Data typically reported in concentration ranges

	Level III
Type of analysis	Organics/inorganics performed in an off-site analytical laboratory May or may not use Contract Laboratory Program (CLP) procedures Laboratory may or may not be a CLP laboratory
Limitations	Tentative compound identification in some cases.
Data quality	Detection limits similar to CLP Rigorous QA/QC

TABLE C-2
(Continued)

	Level IV
Type of analysis	Hazardous Substances List (HSL) organics/inorganics by gas chromatography/mass spectroscopy (GC/MS), AA, ICP Low parts-per-billion detection limits.
Limitations	Tentative identification of non-HSL parameters Validation of laboratory results may take several weeks
Data quality	Goal is data of known quality Rigorous QA/QC

	Level V
Type of analysis	Analysis by nonstandard methods
Limitations	May require method development or modification Method-specific detection limits Will probably require special lead time
Data quality	Method-specific

[1]Source USEPA, 1987 (modified)

characterization of the untreated composite water samples and for the second round of testing of treatments judged most promising, USEPA- and EG&G-approved analytical methods will be employed (analytical Level III) The testing protocol for the second round includes additional QC samples taken from the treatability tests and a more complete characterization of samples by the following methods (Tables 2-1 and 3-1 of the LAP give additional details) USEPA methods for metals by atomic absorption, USEPA and Standard Methods (American Public Health Assn , 1989) for water quality parameters, USEPA Method 8240 for volatiles, and EG&G-approved methods (GRRASP, EG&G, 1990a) for alpha and beta activity, uranium isotopes, plutonium isotopes, and americium Additional USEPA Methods are specified to characterize the samples submitted for Toxicity Characteristic Leaching Procedure (TCLP) studies These procedures provide an enhanced level of QA/QC, both in the treatability studies and the analytical laboratories, and documented detection limits to help compare performance of the optimal treatments

It is important to distinguish the objective of these analytical studies from those of other investigations of OU2 at RFP These studies are intended to help characterize the untreated and treated surface water samples from OU2, before and after optimal treatment technology bench tests These studies are not designed for site characterization of OU2, therefore, data generated from this study will not be entered into the RFP main database

C-3 1 2 Types of QC Samples

The types of QC samples which will be used in this study are defined below

Duplicate Samples

Duplicate samples are independent samples collected in such a manner that they are, to the extent possible, equally representative of the parameter(s) of interest at a given point in time A certified clean sample bottle will first be filled, followed by the duplicate sample bottle The order of sampling will follow that given above Duplicate samples will be analyzed for the same analytes as the original sample Duplicate samples will be collected as described in Table 3-1 of the LAP

Trip Blanks

Trip blanks are prepared prior to the sampling event by the analytical laboratory in 40-ml volatile organic containers and are kept with volatile organic sample coolers throughout the sampling and transportation events They are then packaged for shipment with the samples and sent for analysis At no time after their preparation are the sample containers opened before they reach the analytical laboratory Trip blanks will be analyzed for VOCs only Trip blanks will be collected at a rate of one per cooler of samples shipped for laboratory (bench-scale treatability study) samples and analyzed for VOCs at a frequency of one per day If shipments of volatiles are received intact at the analytical laboratory, only one trip blank per day will be analyzed

Blank Samples

Blank samples are prepared by filling certified clean sample bottles identical to those used for chemical analysis samples with analyte-free distilled water, in a manner similar

to the sampling procedure This process includes using the same personnel, location, and equipment whenever possible These samples will be used to evaluate the possibility of contamination because of the sampling environment Blank samples will be prepared and submitted with laboratory (bench-scale treatability study) samples Blanks will be collected for laboratory (bench-scale treatability study) samples as described in Table 3-1 of the LAP

Matrix Spikes/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples are independent samples collected in such a manner that they are, to the extent possible, equally representative of the parameters of interest at a given point in time. The same procedure used for collecting duplicate samples will be followed when collecting the MS and MSD samples The laboratory then spikes the extra volume of sample with the analytes of interest For metals analyses, matrix spike and spike duplicate samples are analyzed by the laboratory Matrix spike/duplicate samples will be collected for laboratory (bench-scale treatability study) samples as described in Table 3-1 of the LAP.

Treatment Blank

This sample will be prepared by pouring analyte-free distilled water through a clean ion exchange resin or GAC column into a sample bottle. This sample will then be analyzed for all analytes requested for the regular samples of water treated by the column This sample will serve as a check on cleaning of the columns or leaching of chemicals from

the columns themselves Treatment blanks will be collected for the final treatment runs on ion exchange and GAC columns as described in Table 3-1 of the LAP

C-3 1 3 Data Quality Parameters

The data quality parameters of accuracy, precision, completeness, comparability, and accuracy will be assessed in the following ways in this study

Accuracy

Accuracy is the nearness of a result or the mean of a set of results to the true value Accuracy will be assessed by percent recoveries of spiked samples in laboratory analyses Accuracy limits for analytical results for characterization of untreated water and testing of optimal treatments will be as stated in the appropriate USEPA Method or the GRRASP (EG&G, 1990a)

Precision

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions Precision will be assessed by laboratory analyses of duplicate/replicate samples Precision limits for analytical results for characterization of untreated water and testing of optimal treatments will be as stated in the appropriate USEPA Method or the GRRASP (EG&G, 1990a)

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that could be obtained under optimum conditions Amounts of data to be collected are defined in the individual workplans, i.e., the FSP, the LAP, and the Treatability Study Work Plans (TSWPs) for the bench-scale treatability study The goals for completeness in each of these phases of the study is 90 percent

Comparability

Comparability expresses the confidence with which one data set can be compared with another In order to assess comparability, field sampling procedures, laboratory sample preparation procedures, analytical procedures, and reporting units must be known Qualitatively, data subjected to strict QA/QC procedures and collected under specific operating conditions, will be deemed more reliable, and therefore more comparable, than other data

Representativeness

Representativeness is the degree to which a set of data accurately represents the characteristics of a population, a process condition, or an environmental condition For the purposes of this study, the aim will be to sample and composite for bench-scale treatability testing surface water which is representative of the more-contaminated sources within OU2 The sampling objectives and procedures for compositing the surface water samples in the field are discussed in detail in Sections 2 0 and 3 4,

respectively, of the FSP Available data from monthly sampling and analysis from surface water stations in OU2 were reviewed to select sites where water samples have yielded detectable volatile organics and radionuclides above background levels

C-3 2 ANALYTICAL METHODS

Specific analytical methods to be used for samples are specified in the LAP Samples taken to monitor the progress of initial bench-scale treatability testing at Hazen Research will be analyzed for a limited list of analytes within 24-hours (Table 2-1 of LAP) These samples will be analyzed for TSS, TOC, gross alpha and beta radioactivity, and water quality parameters Certain analytes are designed to serve as indicators of contaminants of concern (total organic carbon as an indicator of volatile organic compounds and gross alpha and beta radioactivity as an indicator of radionuclides)

For samples to be fully characterized, EG&G-approved methods for radionuclides and methods from SW-846, Test Methods for Evaluating Solid Waste, third edition (USEPA 1986) will be used Samples to be so characterized include the untreated composite water samples and critical samples to be taken from second round of the laboratory bench-scale treatability tests Specific methods and numbers of samples are given in Tables 2-1 and 3-1 of the LAP

Laboratories to be used, in addition to Hazen Research, Inc, Golden, CO, which will analyze samples to monitor the progress of bench-scale testing, include the following (Table 2-1, LAP)

Hauffman Laboratories, Golden, CO (Total organic carbon)

TMA/NORCAL Laboratory, Richmond, CA (Radionuclides by EG&G-Approved Methods, EG&G 1990a)

TMA/Skinner-Sherman Laboratory, Richmond, CA (Metals by SW-846 Methods and Water-Quality Parameters by EPA Methods or Standard Methods)

Vista Laboratories, Inc, Wheatridge, CO (Volatile Organic Compounds by EPA Method 8240 for water samples and Toxicity Characteristic Leaching Procedure (TCLP) on solidified residuals)

C-3 3 SAMPLING PROCEDURES

Sampling procedures for the bench-scale treatability study for surface water from OU2 are given in detail in Section 5.0 of the FSP and Section 3 2 of the LAP for this study (Volume 2) Sample containers, procedures, reagents, preservation methods, and holding times are given in Sections 5 0 and 6 0 of the FSP for the field sampling and in Table 2-3 of the LAP for the bench-scale treatability study samples.

Forms, notebooks, and procedures used to record field sample history and sampling conditions are provided in Standard Operating Procedure (SOP) No. 14, Logbook Protocol, for Surface Water Data Collection (EG&G 1990b).

C-3 4 DATA REDUCTION, VALIDATION/VERIFICATION, AND REPORTING

Data reduction, validation, and reporting procedures are detailed in Section 3.3 3 of the site-wide QAPjP Field data reduction and validation will be performed and documented by Woodward-Clyde, as required by Section 3 3.3 of the site-wide QAPjP For samples taken from the first round of treatability testing, only semi-quantitative or qualitative information is required As explained in the TSWP (Appendix A), the initial round of testing generally compares treatments to each other based on percentage reduction in an indicator parameter after treatment Results from these initial studies will be reviewed by project chemists and any apparently unusual results evaluated Laboratory notes and calculations for treatability testing will be reviewed, initialled, and dated by a second analyst to check calculations for accuracy and detect transcription errors

However, a further verification of data will be performed for samples analyzed for initial characterization of the untreated surface water composites and for samples from the second round of testing of treatments judged most promising This will include a review of the analytical laboratory data package for completeness and acceptability of the information listed on Table C-3 The project chemist will check the chain of custody, holding times, results of method blanks, laboratory control samples and other laboratory QC samples, results of calibration, and results of QC samples submitted from the bench-

Table C-3

Checklist for Verification of Analytical Laboratory Data*

_____ Chain of Custody

_____ Holding Times

_____ Listing of Analytical Methods Used

_____ Method Blank

_____ Laboratory Control Sample

_____ Laboratory Duplicate Samples

_____ Calibration Results

_____ QC Samples from Treatability Studies

- _____ Blank Samples
- _____ Treatment Blanks
- _____ Duplicates
- _____ Matrix Spike/Spike Duplicate Samples

*See text for explanation of types of analytical samples to be verified

scale treatability studies. In verifying the analytical results, the project chemist will use as guidelines the guidelines stated in EG&G Data Validation Functional Guidelines (EG&G, 1990c)

C-3 5 INTERNAL QUALITY CONTROL CHECKS

Quality control (QC) samples to be collected in the field and additional QC samples to be prepared and analyzed in the laboratory are discussed in Section C-3 1 2 of this QAA and in the FSP and LAP (Volume 2) General considerations related to internal quality control checks are discussed in Section 3 3 4 of the sitewide QAPjP

C-3 6 DATA ASSESSMENT

Data assessment of analytical laboratory data will be as described in Section C-3 4 above Criteria for assessment of treatability test results are given in the individual TSWPs (Volume I, Appendix A of this report) A summary of procedures for laboratory data assessment is contained in Section 3.3 5 of the sitewide QAPjP

Precision, accuracy, and completeness of field data will be controlled by following procedures in the FSP and in the SOPs for Surface Water Data Collection (EG&G, 1990b) and procedures for field data validation and calculations presented in Sections 3 3 3 1 and 3 3 3 2, respectively, of the sitewide QAPjP

C-4 0
PROCUREMENT DOCUMENT CONTROL

Procedures for control of procurement documents are stated in Section C-4 0 of the sitewide QAPjP

C-5 0
INSTRUCTIONS, PROCEDURES, AND DRAWINGS

Requirements and methods by which EG&G ER Department instructions, procedures, and drawings are prepared, reviewed, and approved are discussed in Section 5 0 of the sitewide QAPjP Section 5.3 of the same document describes compliance and action to resolve questions regarding SOP, Addenda to the SOPs, and other procedures

C-6 0
DOCUMENT CONTROL

Work products associated with classified Rocky Flats work assignments will be secured in appropriate, locked filing cabinets in a secured area at WC All reports will be provided to EG&G for their classification review prior to printing and distribution.

C-7 0
CONTROL OF PURCHASED ITEMS AND SERVICES

Requirements and methods for vendor selection and the control of purchased items and services are listed in Section 7 0 of the sitewide QAPjP

Under this contract, WC will use existing facilities and equipment at Hazen Research, Inc Any additional equipment needed is expected to be leased Glassware and certain laboratory supplies will be purchased as expendable supplies, in accordance with procedures in Section 7 0 of the sitewide QAPjP

C-8 0
IDENTIFICATION AND CONTROL OF ITEMS AND SAMPLES

C-8 1 SAMPLE IDENTIFICATION

Samples taken during the treatability study will be assigned identification numbers based on the treatability study design. This identification system is explained in Section 2 3 of the LAP, Volume II

C-8 2 SAMPLE CHAIN-OF-CUSTODY AND SECURITY

Sample custody will be maintained as described in Section 8 3 2 4 of the sitewide QAPjP Section 8 0 contains additional procedures to be followed for identification and control of items and samples, while Section 13 0 of the sitewide QAPjP describes procedures for sample handling, storage, and shipping The flow chart for sample screening and handling is shown in Figure 8-1 of the sitewide QAPjP

Sample identification and custody procedures for field sampling shall conform with authorized EG&G chain-of-custody procedures for field and laboratory activities Field sample security and chain-of-custody procedures are described in SOPs No 2, 3, and 13 of Surface Water Data Collection Program SOPs (EG&G 1990b) Laboratory sample security and chain-of-custody procedures are described in Exhibit III, Specifications for Chain-of-Custody, Documentation Procedures, and Written SOPs, of the General Radiochemistry and Routine Analytical Services Protocol (GRRASP, EG&G, 1990a)

Sample custody for sample collection and shipment of treatability study samples to the laboratory will be maintained by WC Once the samples have been received in the laboratory, custody of the samples will be accepted by the laboratory through the signing of the chain-of-custody (COC) form which will then be returned to WC An example of a WC COC form is presented in Figure C-2

The laboratory will be responsible for maintaining custody of the samples and evidence files, as appropriate All final evidence files will be maintained under documented control in a secured area

C-8 3 SAMPLE HOLDING TIMES

Holding times for samples taken as part of the treatability study are given on Table 2-2 of the LSP, Volume II

Woodward-Clyde Consultants
Stanford Place 3 Suite 1000 4582 South Ulster Street Parkway
Denver Colorado 80237 (303) 694 2770

Chain of Custody Record

PROJECT NO

SAMPLERS (Signature)

DATE	TIME	SAMPLE NUMBER	ANALYSES	NUMBER OF CONTAINERS

REMARKS
(Sample preservation handling procedures etc.)

For _____

Matrix –

All samples stored on ice

Contact personnel

TOTAL NUMBER OF CONTAINERS

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)

METHOD OF SHIPMENT	SHIPPED BY (Signature)	COURIER (Signature)	RECEIVED FOR LAB BY (Signature)	DATE/TIME

Job No	22558
Prepared by	BRC
Date	9/19/90

FIGURE C-2
SAMPLE COC FORM

C-9 0
CONTROL OF PROCESSES

This section does not apply to the bench-scale treatability study

C-10 0
INSPECTION

This section of the sitewide QAPjP does not apply to the bench-scale treatability study

C-11 0
TEST CONTROL

Requirements and methods for testing are given in Section 11.0 of the sitewide QAPjP This bench-scale treatability study requires the testing of various treated materials Criteria for evaluation of the various rounds of samples to be tested for each treatment are given in the TSWPs which are presented in Volume I, Appendix A. These criteria are primarily qualitative or semi-quantitative

For example, in the first round of testing for removal of radionuclides from surface water by ion exchange resin columns, the best three (of nine) resins will be chosen based on their percentage removal of gross alpha and beta radioactivity Then the best three will be evaluated on their percentage removal of specific radionuclides of concern from the OU2 surface water Similar procedures will be used to identify the most promising treatment media in the remaining treatability tests

A WC chemist will be available at Hazen Research during the treatability study The WC chemist will observe testing, supervise the collection and shipping of samples from the treatability tests, and, in consultation with WC process engineers, advise on treatability testing WC process engineers will periodically visit Hazen Research to observe critical phases of the bench-scale testing and to provide oversight

C-12 0
CONTROL OF MEASURING AND TEST EQUIPMENT

C-12 1 CALIBRATION AND MAINTENANCE

Procedures for the documentation and calibration of measuring and test equipment are described in Section 12 3 of the sitewide QAPjP and in SOP No 10 of the Surface Water Data Collection Program SOPs (EG&G 1990b) In addition, the analytical laboratories shall perform calibration and maintenance as described in the GRRASP (EG&G 1990a)

C-12 2 PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

Preventive maintenance procedures and schedules are discussed in Section 12 3 5 of the sitewide QAPjP

C-13 0
HANDLING, STORAGE, AND SHIPMENT

Requirements and methods for handling, storage, and shipping of samples are established in Section 13 0 of the sitewide QAPjP, in SOP No 3 of the Surface Water Data Collection Program SOPs (EG&G 1990b), and in Section 6 0 of the Field Sampling Plan and Section 4 0 of the LAP (Volume II) In addition, requirements for handling samples and chain-of-custody procedures are discussed in Sections 3 0 and 8 0 of the sitewide QAPjP The handling, storage, and shipping of hazardous wastes are addressed in the Rocky Flats Plant Resource Conservation and Recovery Act (RCRA) Hazardous and Mixed Waste SOPs

Sample collection and shipping restrictions will be followed to comply with the Sample Exclusion Provision (40 CFR 261 4(d)) of RCRA. This provision, which exempts waste samples collected for the sole purpose of determining their characteristics or composition from regulation under Subtitle C of RCRA, has been expanded to include waste samples used in small-scale treatability studies (53 FR 27301) This expanded provision is referred to as the Federal Treatability Study Exemption Rule In accordance with this rule, samples that are collected, stored, or transported to an off-site laboratory or testing facility will be exempt from the RCRA generator and transporter requirements (40 CFR Parts 262 and 263) by following these guidelines·

- WC will not collect or ship more than 1,000 kilograms (kg) of any nonacute hazardous waste, 1 kg of acute hazardous waste, or 250 kg of soils, water, or

debris contaminated with acute hazardous waste per waste stream per treatment process.

- WC will package samples so that they will not leak, spill, or vaporize from their packaging during shipment WC will transport samples to comply with U S Department of Transportation (DOT), U.S Postal Service, or any other applicable regulations for shipping hazardous materials All sample packages must be surveyed for radioactivity following RFP and DOT requirements Packages must be appropriately labelled after surveys, according to DOT regulations (49 CFR 173).

- WC will ship samples only to laboratories or testing facilities that are exempt under 40 CFR 261 4(f) or that have appropriate RCRA permits or interim status In addition, laboratories or testing facilities must be licensed to handle the amounts and types of radionuclide expected to be present in the samples

C-14 0
STATUS OF INSPECTION, TEST, AND OPERATIONS

This section of the sitewide QAPjP does not apply to the bench-scale treatability study

C-15 0
CONTROL OF NONCONFORMANCES

Procedures for documenting and dealing with nonconformances are listed in Section 15 3 of the sitewide QAPjP The nonconforming item, service, sample, or data may be evaluated and used, reworked, repaired, or rejected, as specified in Section 15 3 of the sitewide QAPJP An example of the Nonconformance and Corrective Action Report to be used by Woodward-Clyde personnel and their subcontractors is shown in Figure C-3

NONCONFORMANCE AND CORRECTIVE ACTION REPORT (NCR)

DATE: _____

WCC NCR NO: _____

SUBMITTAL

TO: Project Manager
QA/QC Officer

Description of Nonconformance and Cause: _____

_____

_____

Proposed Corrective Action _____

_____

_____

Submitted by _____ Location _____

Approved by _____ Date _____

CORRECTIVE ACTION (by Project Manager or Designee)

Implementation of Action Assigned to: _____

Actual Corrective Action: _____

_____

_____

_____

Implementation verbally approved by QA Officer on _____
(Date)

Action implemented on _____
(Date)

_____
(Signature)

VERIFICATION (By QA/QC Officer or Designee)

Corrective Action implementation reviewed and work inspected by _____

on _____

Job No 22558E-T300	NONCONFORMANCE AND CORRECTIVE ACTION REPORT
Prepared by S L J	
Date 9/18/90	

Figure C-3

C-16 0
CORRECTIVE ACTION

Corrective action procedures are presented in Section 16 0 of the sitewide QAPjP As noted, a copy of a Nonconformance and Corrective Action Report to be used by Woodward-Clyde personnel and their subcontractors is shown in Figure C-3

C-17 0
QUALITY ASSURANCE RECORDS

WC will maintain a secured QA records file for project documents, as specified in Section 17 0 of the sitewide QAPjP. The specific QA records to be maintained for this project include

- Records prepared and maintained to demonstrate implementation of QA programs (e g , audit plans, reports, and corrective actions)
- Specific correspondence and directives
- Plans and procedures
- Data, maps, photographs, logs, field notebooks, data sheets, lab analyses
- Drawings, designs
- Other materials that provide data and record quality

C-18 0 QUALITY VERIFICATIONS

Because of the anticipated accelerated schedule of the bench-scale treatability study of OU2 surface water, a separate yearly overall audit of the entire project will not be performed

C-18 1 FIELD OPERATIONS AUDITS

Field audits of the FSP will be performed during the laboratory set-up period of this treatability study Procedures to be followed in performing the audit and documenting audit findings are discussed in Section 18 3 1 5 of the environmental evaluation QAPjP The conduct of field audits shall be conducted in accordance with the guidelines set forth in procedures and guidelines for conducting internal sampling audits (EG&G, 1989b)

C-18 2 LABORATORY AUDITS

All analytical laboratories used for this study will be approved by WC and EG&G Laboratory audits have been conducted and a written report of the audit has been prepared, as required by Section 18 3 1 6 of the sitewide QAPjP The Quality Assurance Plan and SOPs for Hazen Research, Inc, will be filed with the report of the Hazen Research audit WC will recommend appropriate laboratory sample handling and preparation methods to achieve DQOs

In addition to the audit of the laboratory, WC will audit the laboratory handling and sampling procedures for this project and will review all pertinent laboratory notebooks generated on this project

C-19 0
SOFTWARE QUALITY ASSURANCE

Control and documentation of computer software is described in Section 19 0 of the sitewide QAPjP This section does not apply to the bench-scale treatability study

REFERENCES

American Public Health Assn , et al., 1989 Standard Methods for the Examination of Water and Wastewater, 17th Edition, Washington, D C

EG&G, 1989a Rocky Flats Plant ER Program SOPs (Revision 3) January 1989.

EG&G, 1989b Procedures and Guidelines for Conducting Internal Sampling Audits, Rocky Flats Plant December 1988, revised March 1989

EG&G, 1990a General Radiochemistry and Routine Analytical Services Protocol (GRRASP), Scope of Work Rocky Flats Plant February 1990

EG&G, 1990b Rocky Flats Plant Surface Water Data Collection Program SOPs Draft Final, April 1990

EG&G, 1990c Data Validation Functional Guidelines, Environmental Restoration Department, Environmental Monitoring and Assessment Division, EG&G Rocky Flats, Rocky Flats Plant Draft, March 1990

EG&G, 1990d Draft Rocky Flats Plant Sitewide Quality Assurance Project Plan for CERCLA Remedial Investigations/Feasibility Studies and RCRA Facility Investigations/Corrective Measures Studies Activities, Rocky Flats Plant, Golden, Colorado Draft, August 1990

SW-50 SW-51 and SW-58 are located in a ditch along the road east of SW-50, however,overland flow of seepage from SW-50, SW-52, and SW-57 will also enter the ditch Water in the ditch passes under the road south of these locations through a culvert The discharge of the culvert is SW-55 SW-77, another site located on the east side of the road, is just north of SW-55. It is noted therefore, that SW-51, SW-58, and SW-55 are physically connected and likely receive flow from SW-50, SW-52, and SW-57 Two stations farther downgradient that may be included are SW-53 and SW-64

Upper South Walnut Creek

The flow in South Walnut Creek upstream of Pond B-4 is primarily the combined flow from the discharge of these culverts and a spring located at the base of the hill to the south and downstream of the culverts This combined flow is sampled at SW-61 located at the confluence SW-59 is east of SW-61, and may also be used for sampling

U S Department of Energy (DOE), 1990 Surface Water Interim Measures/Interim Remedial Action Plan and Decision Document. 903 Pad, Mound, and East Trenches Areas, Operable Unit No 2, Rocky Flats Plant. Draft, May 1990

U S Environmental Protection Agency (USEPA), 1986 Test Methods for Evaluating Solid Waste 3rd edition, SW-846

USEPA, 1987 Data Quality Objectives for Remedial Response Activities Development Process EPA/540/6-87/083, OSWER Directive 9335 0-7B, March 1987.

USEPA, 1988 Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. EPA/540/G-89/004, OSWER Directive 9355.3-01. Interim Final, October 1988

USEPA, 1989 Guide for Conducting Treatability Studies Under CERCLA. EPA/540/ 2-89/058 Interim Final, December 1989.

Woodward-Clyde Consultants (WC), 1988. Quality Assurance Manual